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ABSTRACT

Discussed in connection with Project PRIME (Programmed Reentry into Mainstream Education) is the need for educational research to assess the comparative efficacy of three instructional settings (regular resource, and self-contained special education classes) for providing services to handicapped children. It is explained that data on the classroom ecological structure (including physical environment, personnel, group structure, and instructional activities) were gathered from observations of teachers in approximately 400 regular, 100 resource, and 150 self-contained classrooms. Noted among findings were differences between regular and special classes in the number of students and instructional personnel (which affected grouping patterns and instructional approaches), and stressed was the need in future analyses to study the effect on student outcomes of each ecological characteristic, both singly and in interaction. (LH)

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The Classroom Ecological Structure: An Approach to the Specification of the Treatment Problem

Judith A. Agard

The goal of special education research is to determine the extent to which a particular educational intervention or treatment affects certain selected outcomes. In laboratory experiments, a treatment can be carefully delineated and systematically manipulated in order to ascertain the precise relationship between the treatment and various outcomes measured. However, educational research often takes place in the real world with treatments consisting of naturally occurring replications of certain broadly defined programatic categories. As a result, special education research is plagued with problems involving; first, defining what the treatment is and, second, determining which particular aspects of the treatment are associated with particular outcomes.

The value of any educational experiment is enhanced when the intervention is described in terms of a set of operations detailed enough to permit replication. Furthermore, for educational research to be of value in determining educational policy, the interventions investigated must be described in enough detail to permit educational decision makers to ascertain the extent to which the results can be generalized and interventions adapted to particular unique situations (Bracht and Glass, 1968). Unless special education research can specify in detail exactly what constitutes a treatment, replication will be difficult and the directives developed for educational change will be ambiguous.

Special education research has been characterized by studies which have had difficulty defining the set of operations inherent in the intervention termed "special education." Kirk (1964) in his criticism of the

special education "efficacy" studies, commented:

> ...there has not been a clear-cut definition of a special class, the curriculum, or the qualifications of special teachers. Special classes vary widely in organization and in curriculum and teaching metnods. Qualifications of teachers vary from well-trained teachers to those subjected to short-term summer courses taught largely by instructors who have had little training or experience with special classes. The administrative labeling of a group of retarded children as a special class for the purpose of receiving state subsidy does not assure it being a special class for experimental purposes (p. 62-63).

In addition tothe lack of specification of the treatment, special education research typically has involved comparisons between broadly defined educational interventions. Although these between treatment comparisons would be of greater value if the treatments were more precisely defined, of equal concern is the need to assess the relationship between particular aspects of tne treatment and particular outcomes. In addition to between group comparisons, special education research also needs to investigate, within each treatment, which particular treatment features are predictive of desired educational effects.

Recently special education research has focused attention on the comparison between "mainstreaming" and segregated programs as the means for delivering special services to handicapped students. Mainstreaming is loosely conceived as administrative arrangements which provide for the provision of special services to handicapped students in a manner which permits them to remain as members of a regular class; while segregated programs involve a self-contained special education classroom.

Kaufman, Gottlieb, Agard and Kukic (1975) have discussed the importance of a within treatment approach rather than a between groups comparison in research on mainstreaming. Kaufman et al., comment,

> Mainstreaming research...has typically been studied in [a] between groups paradigm (e.g., Walker, 1972; Budoff & Gottlieb, 1974). That is, mainstream programs and segregated programs have been compared, and conclusions were made that one or the other treatment was more effective. The between groups approach assumes a homogeneity within each treatment group. Put another way, this paradigm assumes that segregated and mainstreamed special educational services will reflect greater variation between than within treatment conditions...
>
> Given the complexity of mainstreaming constructs, a between groups research paradigm provides information of very limited utility for decision making purposes...The information obtained from a between groups paradigm provides little insight regarding specific aspects of either the segregated or the mainstreaming treatments which differentially effect pupil outcomes. The conceptualization of mainstreaming as a multidimensional treatment involving numerous administrative and instructional options requires the use of a research paradigm which does not concentrate only on between group variance.

Project PRIME has selected as the principal focus for its investigation the question "for whom and under what conditions is mainstreaming a viable educational alternative?" To begin to answer this question, three instructional systems have been selected as educational treatments with heuristic value for a study of mainstreaming: regular classes, special education resource classes and special education self-contained classes. Initially Project PRIME hopes to specify in detail precisely what constitutes the educational treatment implicit in each of these instructional systems. Subsequently, it intends to discover the relationship between the particular dimensions of each system and student outcomes.

This paper attempts to describe the classroom ecological structure of three instructional systems (regular classes, special education resource classes, and special education self-contained classes) using information obtained from classroom observations.

Two of the instructional systems which PRIME has selected for intense investigation are alternative methods for providing special services to handicapped children: resource classes and self-contained classes.

A resource class has been defined by Hammill & Wiederholt (1972) as:

> Any instructional setting to which a child comes for specified periods of time, ususally on a regularly scheduled basis... [while] remaining for at least a portion of the day in his regular class...[T]he primary goal of the resource room teacher is to provide the kind of instructional support to both the child and his teacher that makes feasible the pupil's continued enrollment in the regular class and stimulates his educational and emotional growth. In some cases, this might take the form of direct instruction of the child in the resource room, while in others, indirect instruction through consultation with the child's teacher regarding appropriate teaching materials and management techniques might be sufficient to achieve the desired outcomes (p. 13-14).

The self-contained class is a class composed of students with a single type of handicap who are instructed by a specially trained teacher with access to special materials, equipment and techniques.

Dunn (1973) has described the segregated nature of these classes:

> ...these special classes traditionally have operated on a self-contained basis, ...meaning that the pupils are physically spearated for academic instruction from so-called normal children. Under the special-class plan, pupils receive their academic instruction in the special class, but usually share with the children in the rest of the school such out-of-classroom activities as assembly, sports, school clubs, and dining...In addition, they may also receive instruction from such system-wide, itinerant specialists as the music and art teachers and the speech therapist (p. 28).

Neither of these brief descriptions of the two special education administrative arrangements nor the term "regular class" provide sufficient specification of the education treatment provided in the three instructional systems of interest.

Snow (1974) has argued that educational interventions are complex, interrelated, continuous and multivariate treatments which could be described through the use of multivariate objective observations.

One important domain of an instructional system which can be assessed through classroom observation is the classroom ecological structure. The ecological structure includes such features as the physical environment of the classroom, personnel in the classroom, classroom structure, and instructional activities.

Dunkin and Biddle (1974) have characterized research in the area of the classroom ecological structure (which they termed, "the classroom as a social system") as descriptive in nature. Research in the classroom ecological structure "has sprung from a desire first to describe rather than immediately to improve teaching" (p. 176). The classroom can be viewed as an organized ecological structure certain features of which may have an impact on teacher and pupil behavior. Therefore, a description of the ecological structure of an instructional system is important not only in its own right but also because it provides a framework within which to analyze the more complex teacher and pupil interactive behaviors which form the basic units of an education treatment.

Information on the classroom ecological structure of regular classes, special resource classes and special self-contained classes can be derived from the Classroom Status Data System which formed part of each of the PRIME observation record booklets. The format of the Classroom Status Data System is presented in Figure 1 and described in the Classroom Data Instruction Manual (Semmel and Hasselbring, 1971).

Observation data was collected in real time at a rate of one observation

every four minutes. Each four minute observation is called an episode. A total of 94,000 episodes were used in this analysis; 63,000 episodes from the regular class, 13,000 from the speical resource class and 18,000 from the special self-contained class. Approximately 400 regular teachers, 100 resource teachers and 150 self-contained teachers were observed. The average time each teacher was observed was about 10 hours.

The information reported here uses the eposide as the unit of analysis, a procedure described by Poyner (1975). The ecological structure of an instructional system consists of four major dimensions: physical environment, personnel, group structure, and instructional activities. Each of these areas is defined by specific observation.

Physical Environment

Physical environment includes the physical quality of the room, orderliness and quiet, visual displays, learning centers, and equipment, material and supplies (Table 2). There were no differences in episodes from the three instructional systems in mean ratings of physical quality, mean ratings of orderliness and quiet and percent of episodes in each instructional system with displays present. However, there are differences in the percent of episodes from each type of instructional system in which learning centers and abundant equipment, reference materials and supplies were present. Both special education resource classes and self-contained classes produced a greater proportion of episodes with abundant equipment, reference materials and supplies and learning centers than did regular classes. However, resource classes had more episodes with learning centers than did self-contained classes, while the reverse was true for abundant equipment, reference materials and supplies.

Personnel

Personnel consists of the number of students and the number of

adults present. The presence of an aide, student teacher, helping teacher or supportive personnel is also included in personnel. Regular class episodes had a higher mean number of students present than did special education class episodes; 27 students compared to about 9 students. Furthermore, the percent of episodes with more than one adult present in a resource or self-contained class was double the percent in a regular class; 12% of the regular class episodes had two or more adults present compared with about 24% of the resource and self-contained episodes. This difference is almost entirely attributable to the presence of an aide.

Group Structure

Structure is measured by the seating arrangement, the teacher's position in the room, and the grouping pattern for instruction. Episodes from regular classes reveal that rows and columns was the most frequently observed seating arrangement in the regular class. Although special resource and self-contained classes used the row and columns seating arrangement to some extent, small groups, circles and horseshoes and individual seating arrangements were more frequently observed. Rows and columns were observed more frequently in self-contained classes than in resource rooms however. The teacher was observed front and center more frequently in a regular class. Differences exist between regular and special classes related to grouping strategies. Over three-fourths of the episodes from regular classes involved students working in one large group. Small groups and individual instruction is more frequently observed in special resource and self-contained classes.

Instructional Activity

Subject matter, teacher task and pupil task are three measures of the instructional activity dimension of the classroom ecological structure. Episodes

from regular classes differ from episodes from special resource and self-contained classes primarily in the proportion of episodes involving science/health or social studies. Almost 20% of the regular class episodes involved science or social studies while less than 6% of the speical resource and self-contained class episodes involved science or social studies. Resource class episodes differ from both regular and self-contained class episodes in the proportion of episodes involving reading. Special self-contained classes differ from both regular and resource classes in the proportion of episodes in which art was the subject matter. Perceptual training was more common in both special resource and self-contained class episodes.

The patterns of teacher tasks observed in episodes from each type of instructional system are remarkably similar. Teacher supervising occurs in about 30% of the episodes, teacher directing in about 20% and teacher questionning in about 10% of the episodes. The only differences, and these are relatively minor, appear to be in teacher drilling which was more frequently observed in resource rooms or self-contained classes (7% of the resource room episodes, 5% of the self-contained episodes and 3% of the regular class episodes).

The student task findings also reveal a similar pattern in all three instructional systems. Students were observed working with print material in over 40% of the episodes and interacting with the teacher in 25% of the episodes. Listening to the teacher is more prevalent in special self-contained episodes.

Summary

The ecological structure of the regular classroom involves about 27 students with one teacher. Students are seated in rows and columns, the

teacher is front and center, and the class is organized into one large group working on print material or interacting with the teacher. The resource class can be characterized ecologically as consisting of about 8 students with a teacher supported by an aide about one-fourth of the time. Students are seated in groups or individually and organized into small groups to work on print materials or interact with the teacher; learning centers form part of the physical environment. The special self-contained class consists of about 10 students with a teacher supported by an aide about one-fourth of the time. Students are seated either in rows and columns, small groups or individually, grouped for instruction into one large group, small groups or individually while they interact with the teacher or work on print or non-print material.

A comparison of the ecological characteristics of the three instructional systems reveals the major difference between regular and special classes involves the number of students and instructional personnel present and the resultant ability of the special resource or self-contained class to utilize a small group or individualized approach to instruction. Subject matter content, student activity, and teacher activity do not differ substantially between the regular and special education instructional systems. However, although it may appear that regular classes differ from special, resource or self-contained classes only in the dimension of personnel and the effect on grouping patterns, this preliminary analysis ignores the possibility of interactions among particular dimensions. For example; a given instructional activity, teacher questioning, in conjunction with a particular group structure, small groups, represents a different ecological structure than does the same instructional activity with a large group or with an

individual student. Thus, the full specifications of an educational treatment must look at each measure singularly, as well as in conjunction with other measures. The specification of the treatment does not end with a string of descriptors, interactions among descriptors are also important in characterizing the treatment.

In addition, on each ecological structure measure there is tremendous variation. There are some regular class episodes with learning centers present and there are resource rooms without learning centers. Although it is possible to characterize these educational interventions on the basis of the certain prevalent ecological characteristics, the variations among episodes within the same treatment are of equal interest.

Because each treatment represents a series of natural variations in each dimension of interest, it is possible to study the effects of a particular dimension in relation to student outcomes. Once the dimensions of a treatment have been specified and the natural variations measured, the research focus can shift to specifying within each educational treatment, those particular dimensions of the ecological structure that have an effect on student outcomes.

The classroom ecological structure information presented here demonstrates the potential usefulness of classroom observation data as a means of characterizing a particular educational intervention. In this particular paper, one domain, ecological structure, was broken into four dimensions, physical environment, personnel, group structure and instructional activity. Each dimension was assessed using several observation scales. Using the observational data it is possible to describe in detail the ecological structure of three educational treatments, regular classes, resource classes and self-contained classes. Clear differences were observed among treatments in certain dimensions of the classroom ecological structure but the

treatments were very similar to each other in other dimensions. Subsequent analyses will enable PRIME to determine the particular effect of each of the dimensions of ecological structure singularly and in interaction on particular student outcomes.

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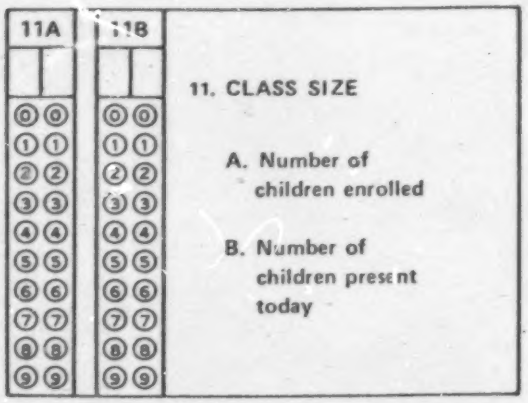
FIGURE 1

Classroom Status Data System Variables



12.

TYPE OF CLASS

- ○ Regular classroom
- ○ Special classroom
- ○ Resource room
- ○ Remedial/tutorial room
- ○ Therapeutic room
- ○ Other

13.

CLASSROOM PHYSICAL ENVIRONMENT

	Very				Not
Clean	○	○	○	○	○
Adequate Lighting	○	○	○	○	○
Appropriate Temperature	○	○	○	○	○
Orderly	○	○	○	○	○
Quiet	○	○	○	○	○
Spacious	○	○	○	○	○
Attractive	○	○	○	○	○
Modern	○	○	○	○	○

14.

PERSONNEL IN CLASS

Directing	Participating	Observing	
○	○	○	Teacher
○	○	○	Student teacher
○	○	○	Speech correctionist
○	○	○	Educational Diagnostician
○	○	○	Aide
○	○	○	Helping teacher
○	○	○	Social worker
○	○	○	Other

Number of adults in classroom: ①②③④⑤

15.

DISPLAYS IN CLASSROOM

Yes	No	
○	○	Children's work displayed
○	○	Learning centers present
○	○	Teacher produced visual displays present
○	○	Commercially prepared visual materials present
○	○	Abundance of equipment, reference materials, supplies, etc.

FIGURE 1 (Cont'd)

17.

ACTIVITY

(E) (C) (K) Reading
(E) (C) (K) Spelling
(E) (C) (K) Language Arts
(E) (C) (K) Mathematics
(E) (C) (K) Science/Health
(E) (C) (K) Social Studies
(E) (C) (K) Art
(E) (C) (K) Music
(E) (C) (K) Foreign Language
(E) (C) (K) Perceptual Training
(E) (C) (K) Transitional Activity
(E) (C) (K) Other

20.

TEACHER TASK

○ Drilling
○ Introducing
○ Motivating
○ Questioning
○ Demonstrating
○ Lecturing
○ Explaining
○ Directing
○ Testing
○ Supervising
○ Summarizing
○ Reviewing
○ Other

19.

STRUCTURE FOR CLASSROOM ACTIVITIES

(E) (C) (K) One large group
(E) (C) (K) Small group with teacher
(E) (C) (K) Small groups without teacher
(E) (C) (K) Individually with teacher
(E) (C) (K) Individually without teacher
(E) (C) (K) Free groups
(E) (C) (K) No apparent structure

21.

PUPIL TASK

(E) (C) (K) Listening to teacher
(E) (C) (K) Interacting with teacher
(E) (C) (K) Interacting with other pupil(s)
(E) (C) (K) Interacting with aide
(E) (C) (K) Working with print material(s)
(E) (C) (K) Working with non-print material(s)

18.

POSITION OF E, C, T and O

FRONT OF CLASS

(E)(C) (T)(O)	(E)(C) (T)(O)	(E)(C) (T)(O)
(E)(C) (T)(O)	(E)(C) (T)(O)	(E)(C) (T)(O)
(E)(C) (T)(O)	(E)(C) (T)(O)	(E)(C) (T)(O)

22.

SEATING ARRANGEMENT

(E) (C) (K) Rows x columns
(E) (C) (K) Small groups
(E) (C) (K) Circle
(E) (C) (K) Horse shoe
(E) (C) (K) Individual
(E) (C) (K) Other

FIGURE 2

Seating Arrangement

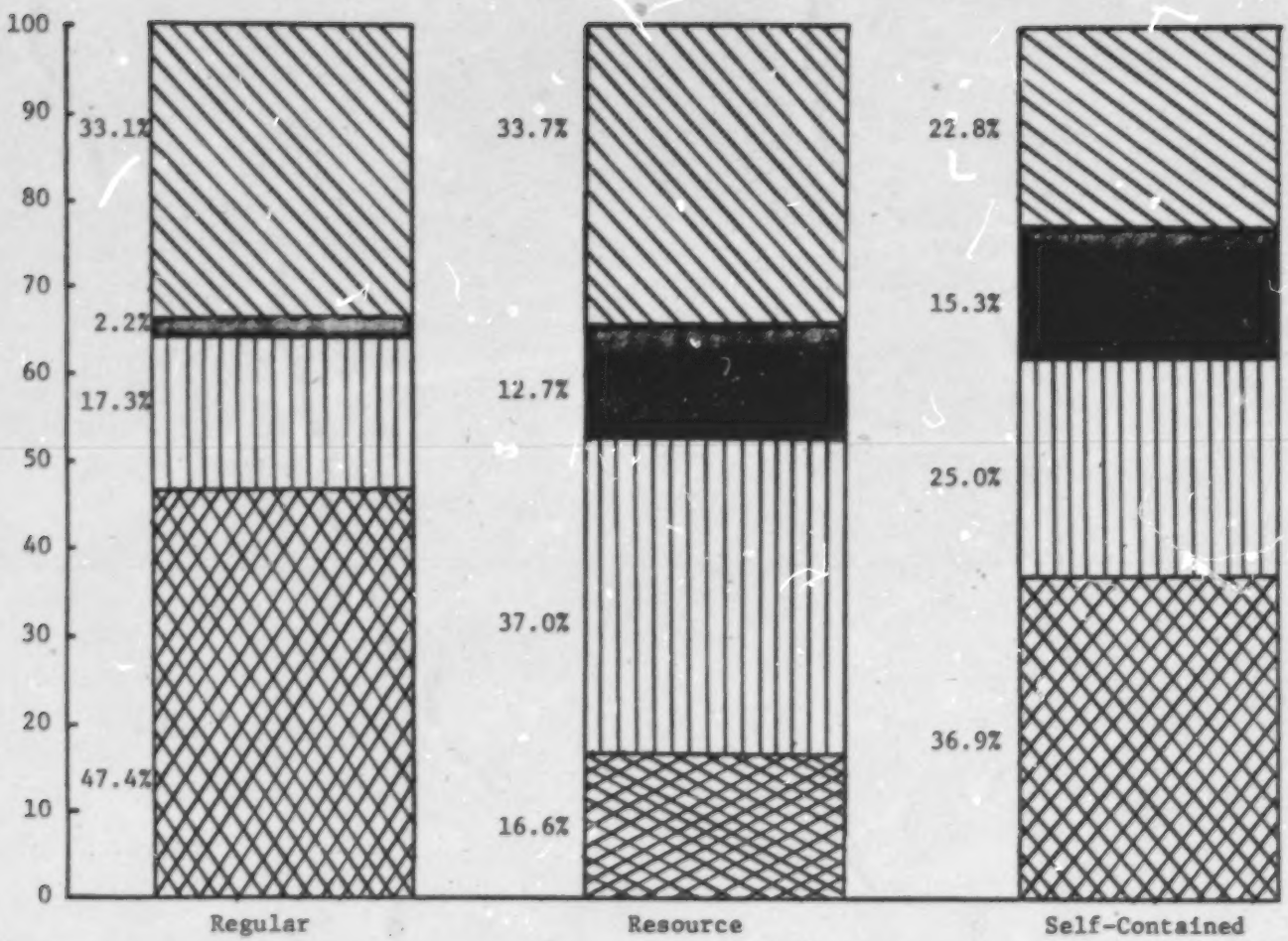


FIGURE 2

Seating Arrangement

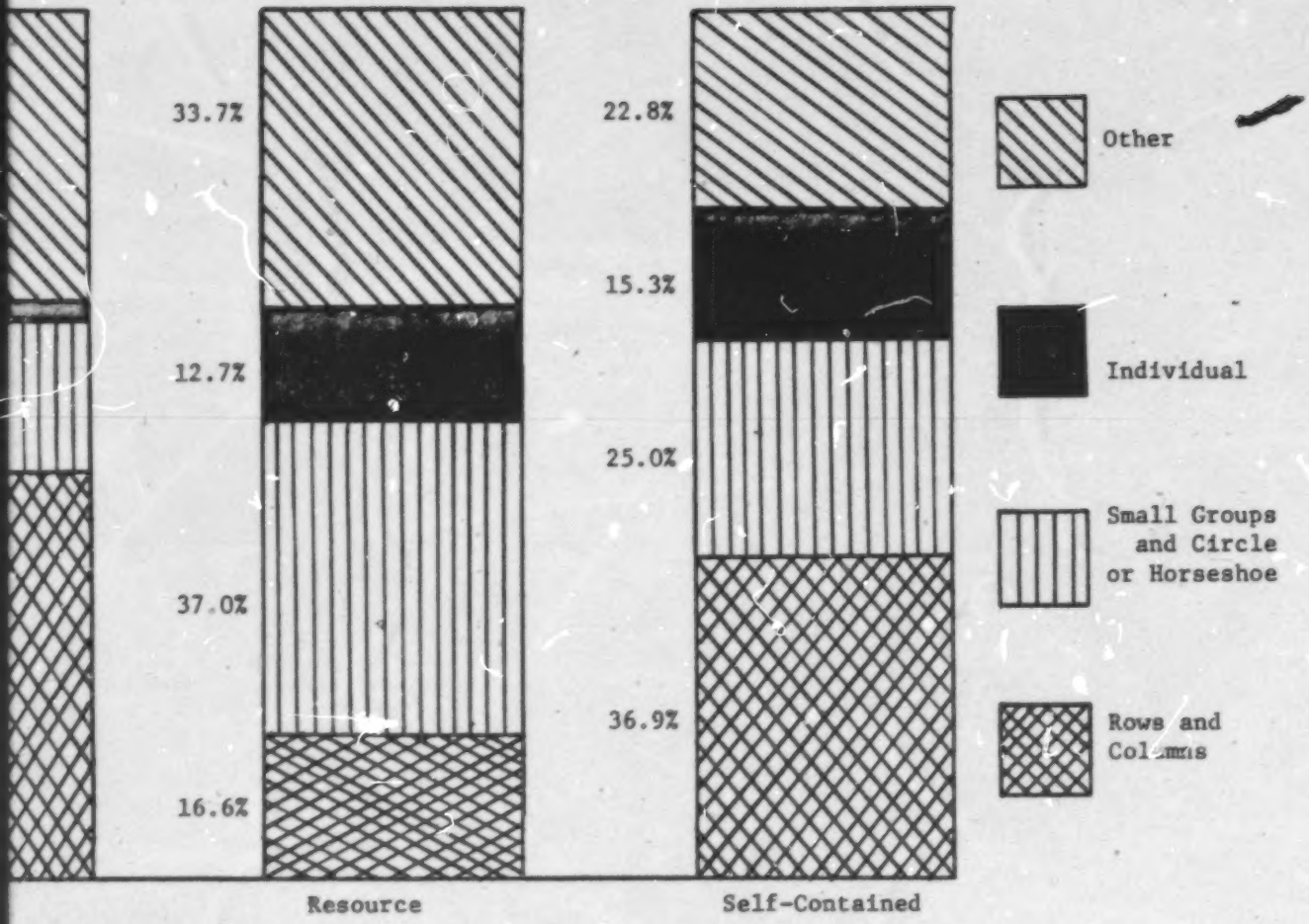


FIGURE 3

Structure for Instruction

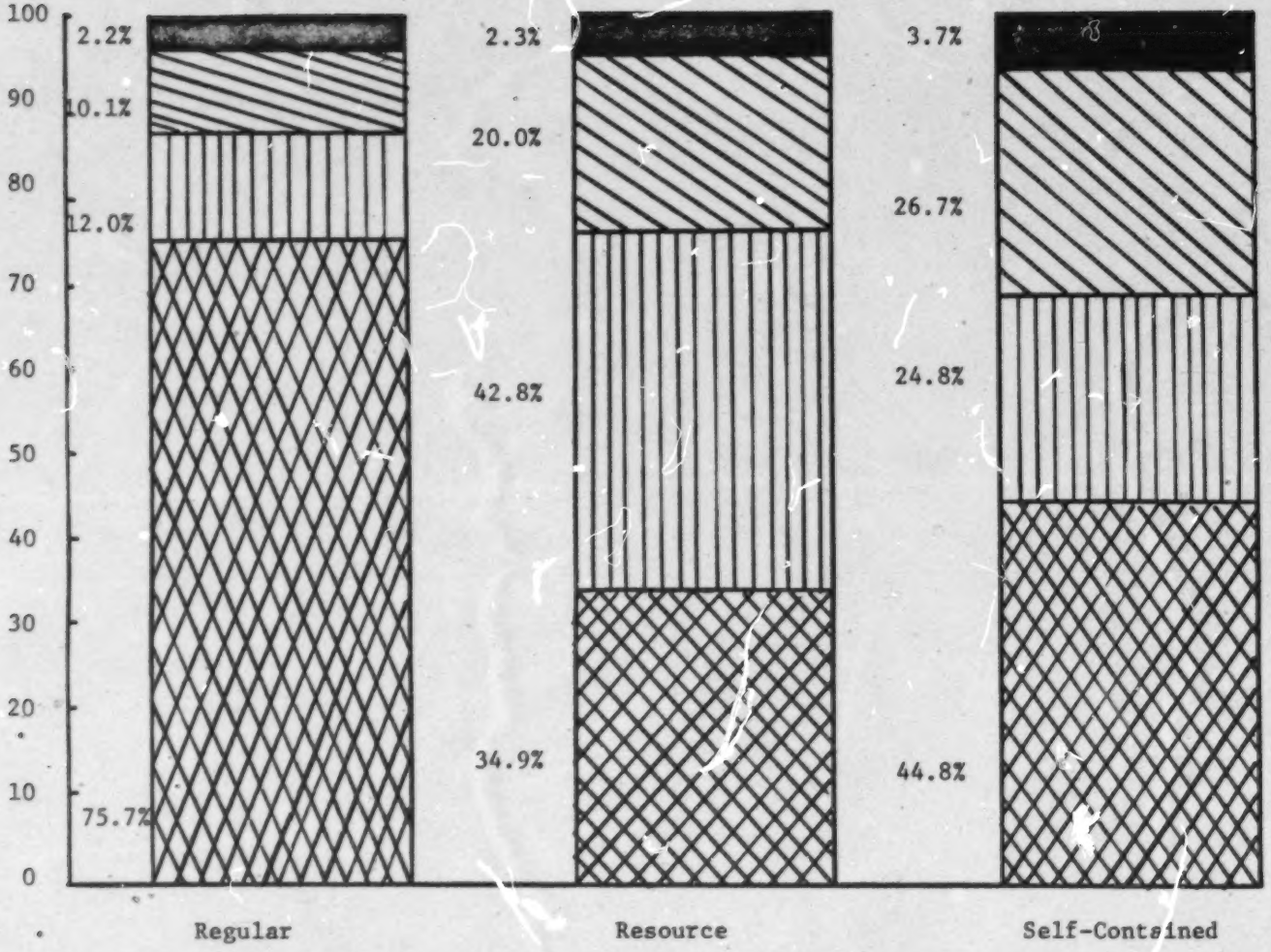


FIGURE 3

Structure for Instruction

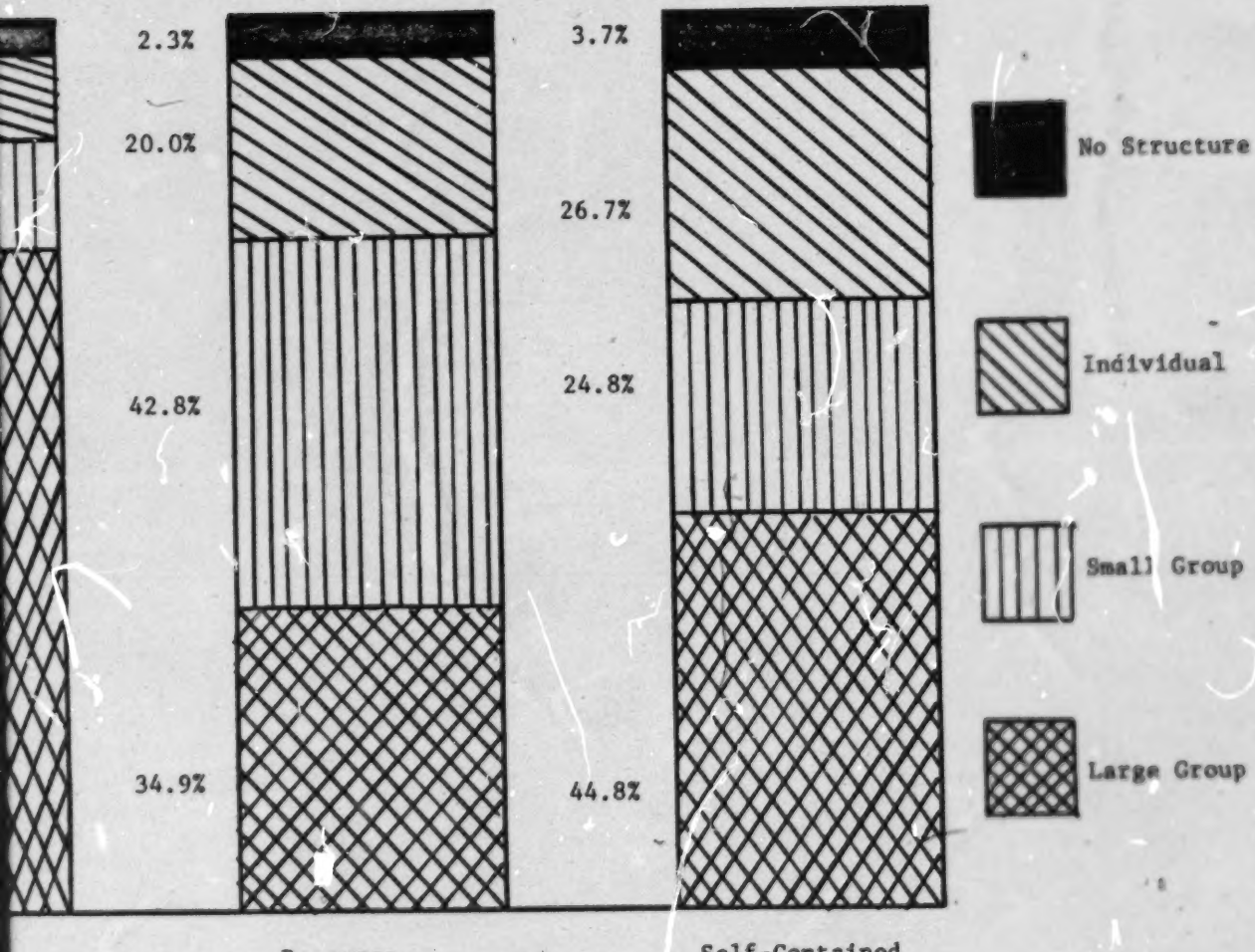


FIGURE 4

Teacher Tasks

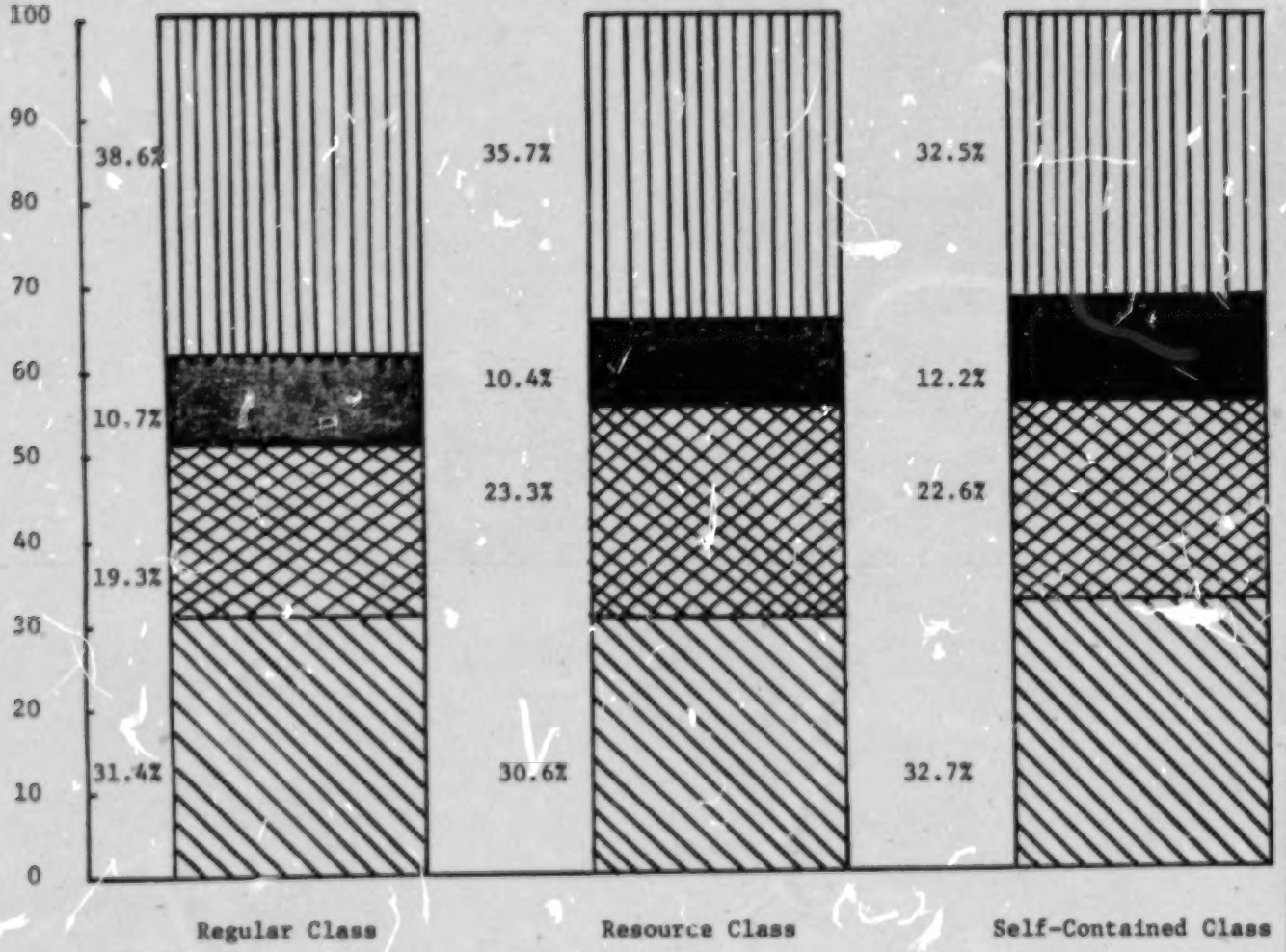


FIGURE 4

Teacher Tasks

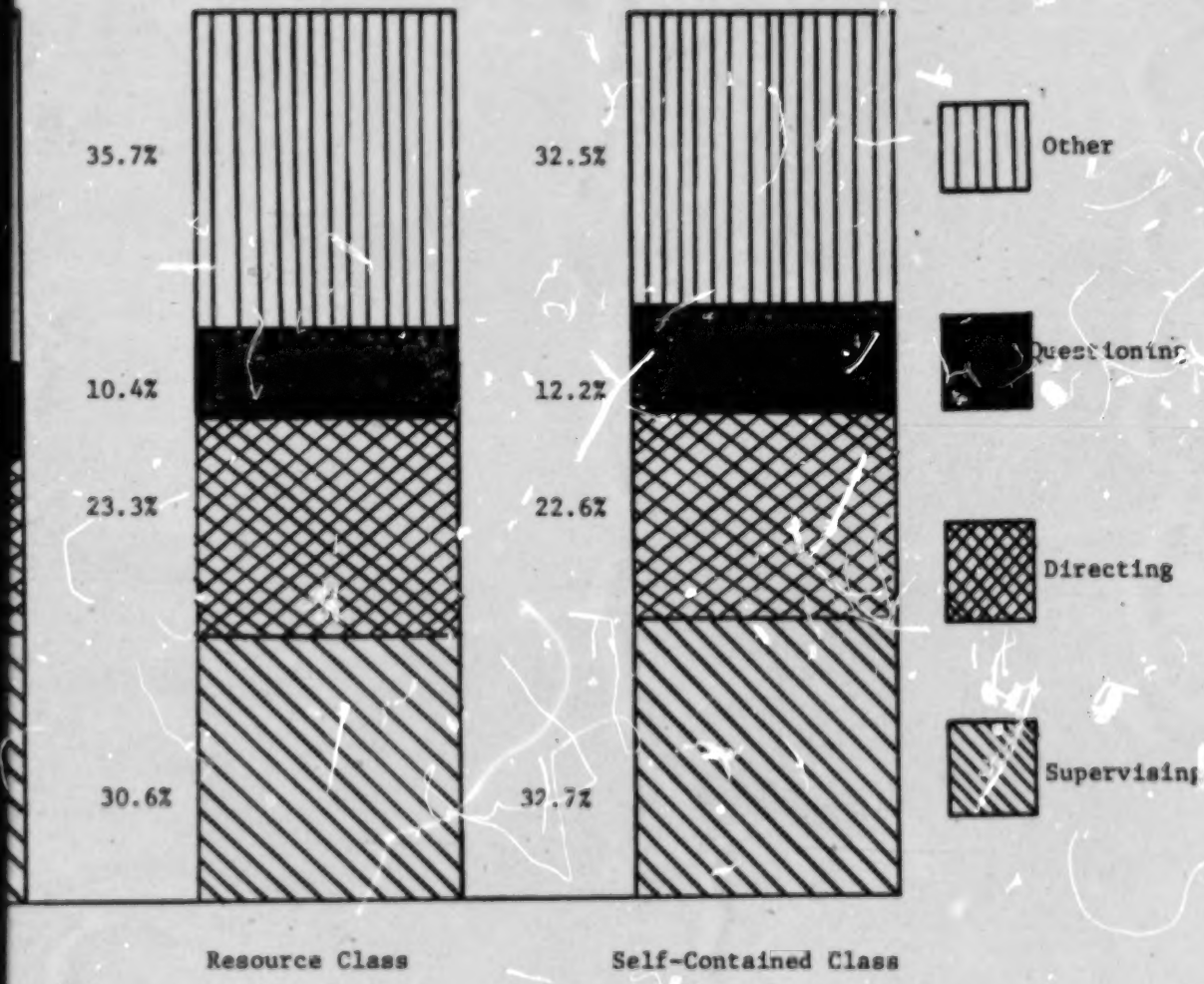


FIGURE 5

Pupil Tasks

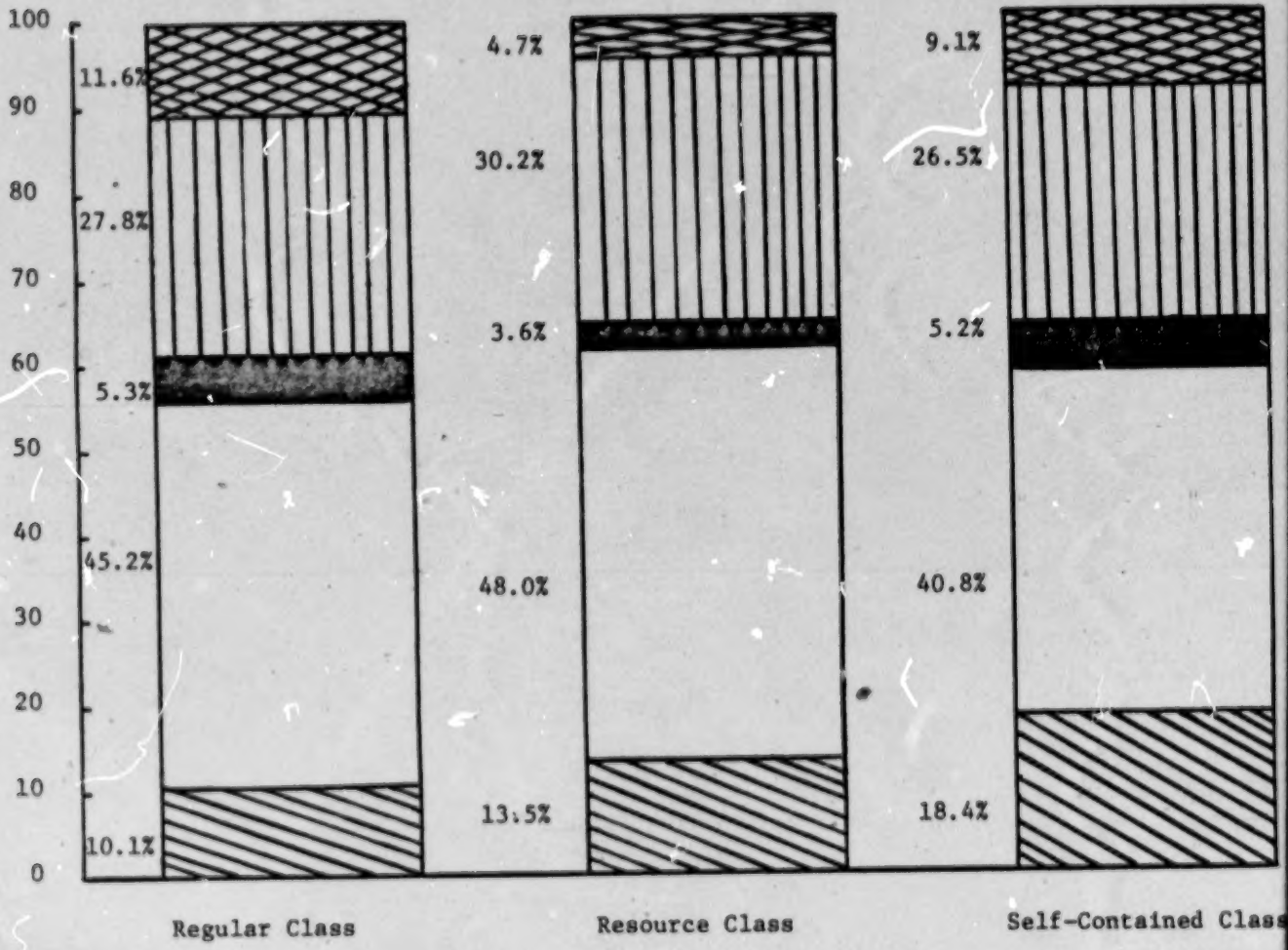


FIGURE 5

Pupil Tasks

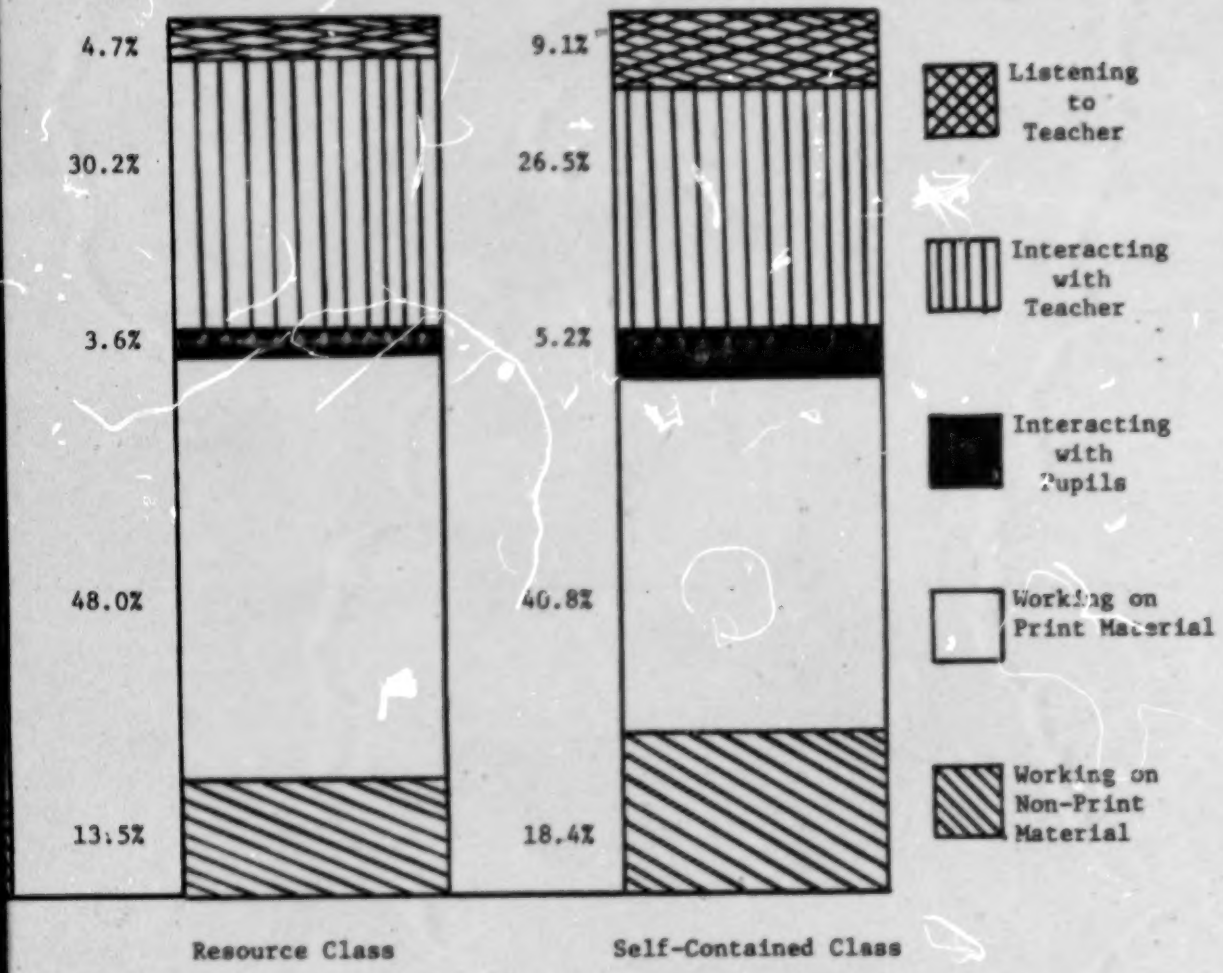


TABLE 1

Physical Environment

	Regular	Resource	Self-Contained
Physical quality (clean, adequate lighting, appropriate temperature spacious, attractive, modern) Mean rating on scale of 1 to 5 (5=very)	3.3 (.7)	3.5 (.8)	3.4 (.7)
Orderly and quiet Mean rating on scale of 1 to 5 (5=very)	3.5 (.7)	3.6 (.8)	3.5 (.8)
Visual displays present (percent of episodes)	97.4%	97.1%	97.8%
Learning centers present (percent of episodes)	69.3%	86.9%	78.5%
Abundance of equipment reference materials and supplies present (percent of episodes)	56.2%	62.4%	70.1%

TABLE 2

Personnel

	Regular	Resource	Self-Contained
Number of students present			
Mean number	26.8 (9.7)	8.3 (7.7)	10.3 (4.9)
Number of adults present			
Mean number	1.1	1.3	1.3
Percent of episodes with two or more adults present	12.1%	25.3%	23.6%
Aide present			
Percent of episodes	3.9%	17.8%	14.8%
Student teacher present			
Percent of episodes	4.3%	1.1%	2.4%

TABLE 3

Structure

	Regular	Resource	Self-Contained
Seating arrangment (percent of episodes of each type)			
Rows and columns	47.4%	16.6%	36.9%
Small groups	13.9	23.7	17.3
Circle or horseshoe	3.4	13.3	7.7
Individual	2.2	12.7	15.3
Other	33.1	33.7	22.8
	100.0%	100.0%	100.0%
Structure for instruction (percent of eposides of each type)			
Large group	75.7%	34.9%	44.8%
Small group with teacher	6.8	34.0	15.9
Small group without teacher	5.2	8.8	8.9
Individual with teacher	.9	6.5	5.9
Individual without teacher	9.2	13.5	20.8
No structure	2.2	2.3	3.7
	100.0%	100.0%	100.0%
Teacher position (percent of episodes of each type)			
Front and center	43.9%	35.5%	33.0%
Front row (including front and center)	72.7%	62.7%	49.2%

TABLE 4

Instructional Activity

	Regular	Resource	Self-Contained
Subject (percent of episodes of each type)			
Reading	17.0%	27.6%	17.3%
Spelling	11.2	11.2	8.7
Language Arts	13.4	14.3	15.7
Mathematics	19.9	20.4	17.0
Science/health	7.4	2.1	2.6
Social studies	11.6	1.8	2.9
Art	2.9	2.4	6.8
Music	.9	.2	1.3
Perceptual training	.6	6.5	4.9
Transitional activity	4.1	2.5	6.1
Other	11.1	11.0	16.7
	100.0%	100.0%	100.0%
Teacher Task (percent of episodes of each type)			
Drilling	2.9%	6.9%	4.9%
Introducing	3.7	2.8	1.6
Motivating	2.1	3.5	2.5
Questioning	10.7	10.4	12.2
Demonstrating	.9	.9	1.0
Explaining	6.8	5.4	5.5
Directing	19.3	23.3	22.6
Testing	6.0	5.4	3.4
Supervising	31.4	30.6	32.7
Reviewing	5.6	3.2	3.3
Other	10.6	7.6	10.1
	100.0%	100.0%	100.0%
Pupil Task (percent of episodes of each type)			
Interacting with teacher	11.6%	4.7%	9.1%
Interacting with pupils	27.8	30.2	26.5
Working on print materials	5.3	3.6	5.2
Working on nonprint materials	45.2	48.0	40.8
	10.1	13.5	18.4
	100.0%	100.0%	100.0%